Track3DKalmanSPS update

Eric Church, 23-Oct-2011

Reminder: Icarus paper shows ~10% energy measurement for MC muons. They apply this to cosmics in a NIM paper.

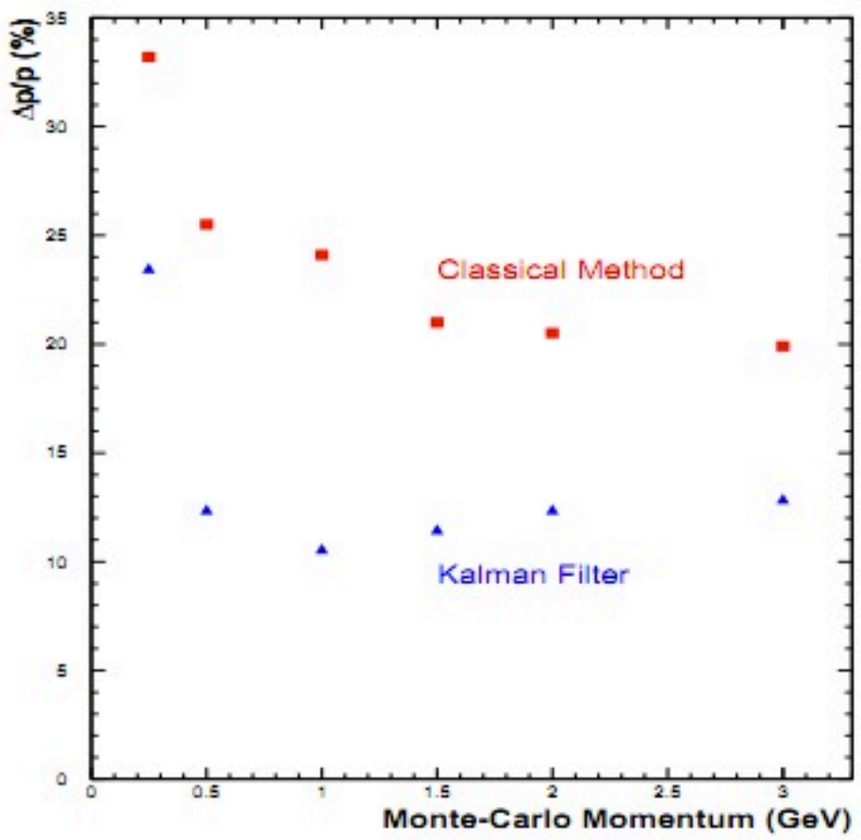
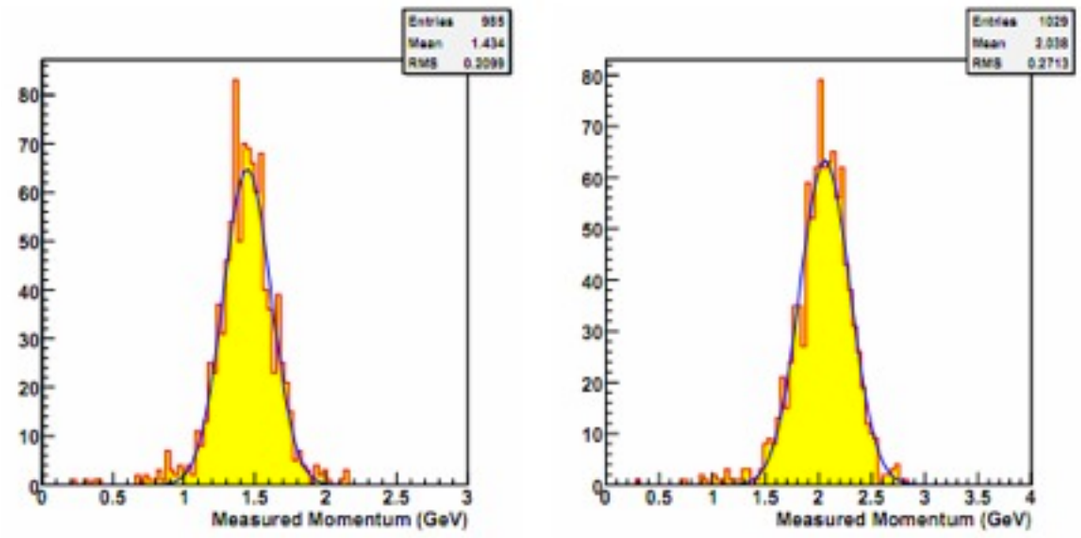


Fig. 7. Comparison between the resolutions for *classical* and Kalman Filter methods.



g. 5. Momentum distributions as given by the Kalman Filter for simulated muons 1.5 and 2.0 GeV.

I generate 250 MC Muons in uBooNE

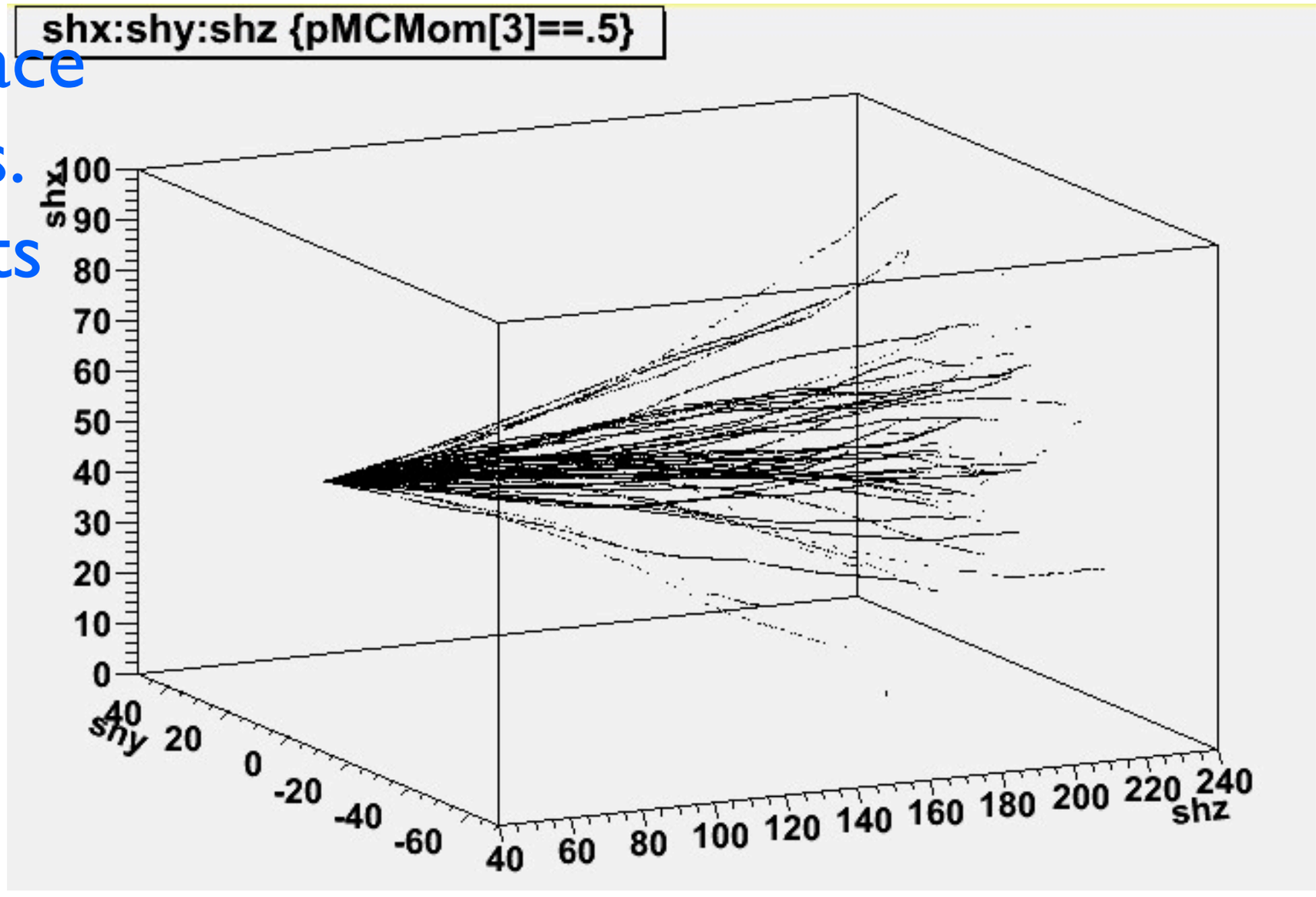
- 50 each at 0.5, 1.0, 1.5, 2.0, 2.5 GeV/c
- Start them at (50,0,50) cm, with 15 deg variation in zy and zx pointing down TPC z axis.
- Remember: TPC is (0 to 250,-110 to +110,0 to1150) cm

Reconstruction

- SingleParticle, LArG4, SimWire, CalWire, HitFinder, DBCluster.
- Then I run module Track3DKalmanSPS. In it SpacePointServices is called. It loops over all combinations of clusters (one in each plane) and finds 3D spacepoints. Sort these in z.
- The Kalman filter runs a track in the usual Kalman way, discussed elsewhere, through those points.

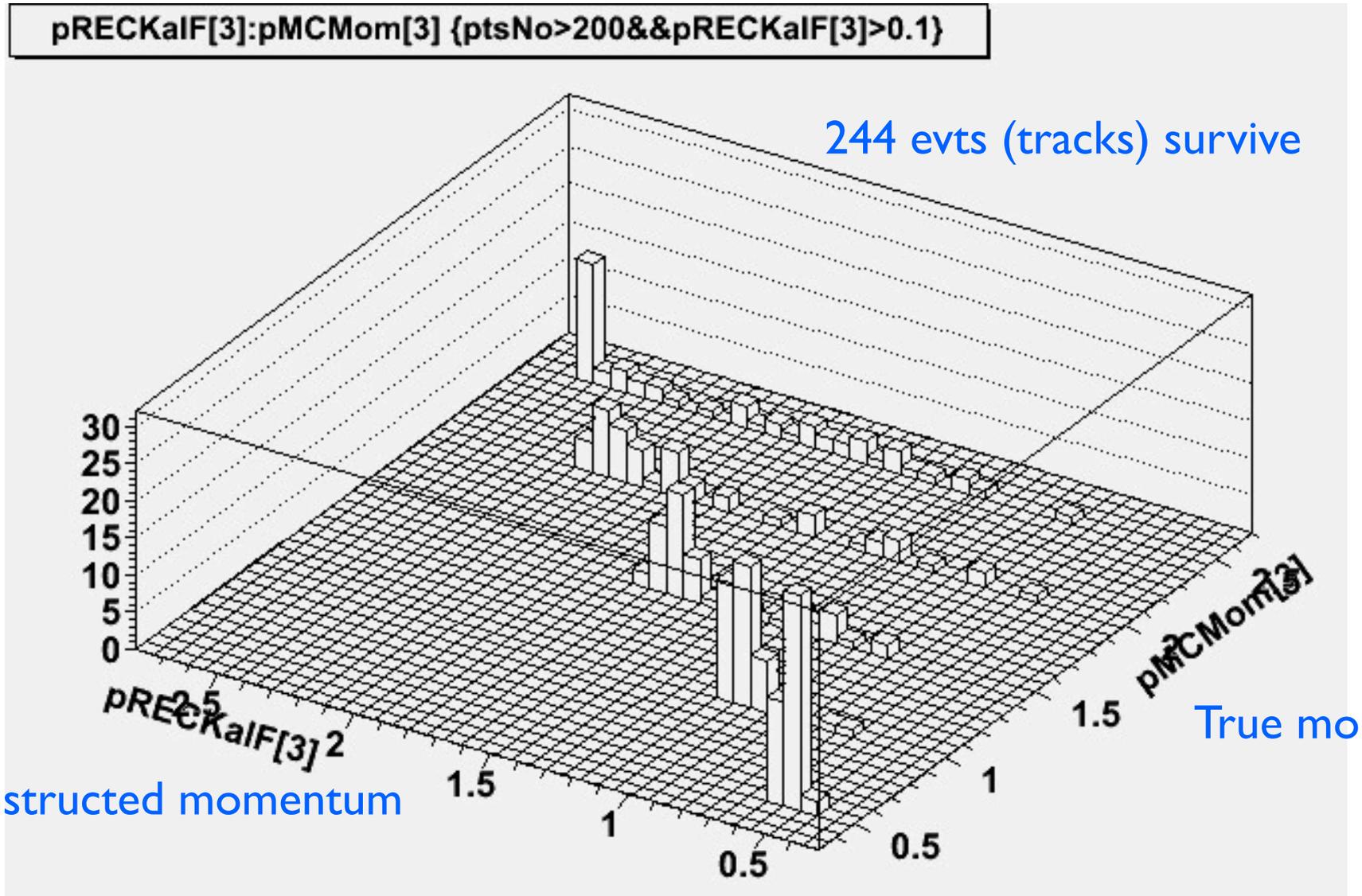
SpaceHits of 0.5 GeV/c mu-s

These are real reconstructed space hits, not G4 hits. There are 50 evts shown.



E resolution: 2 simple cuts

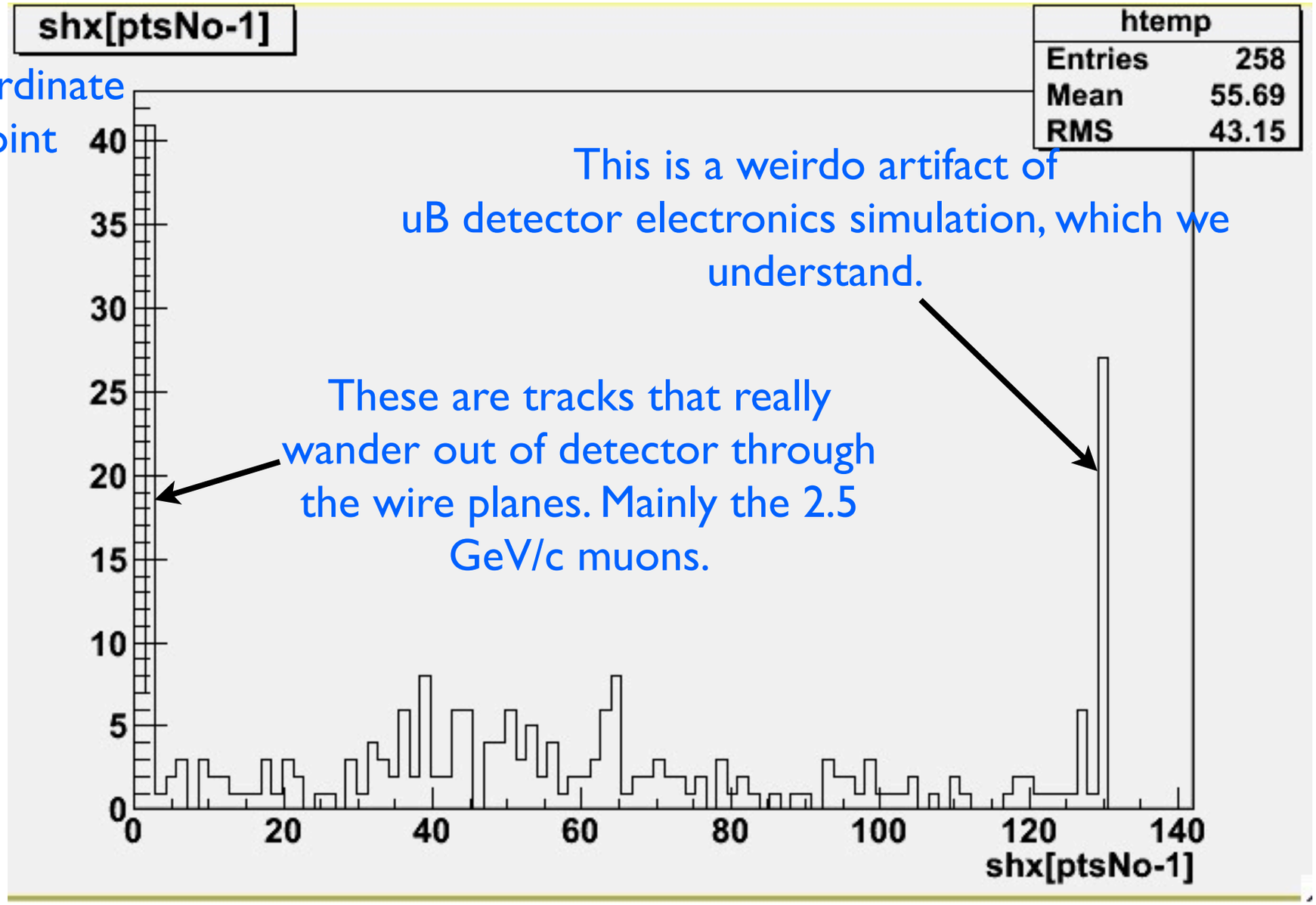
Require only ptsNo>200&&pRECKalF[3]>0.1



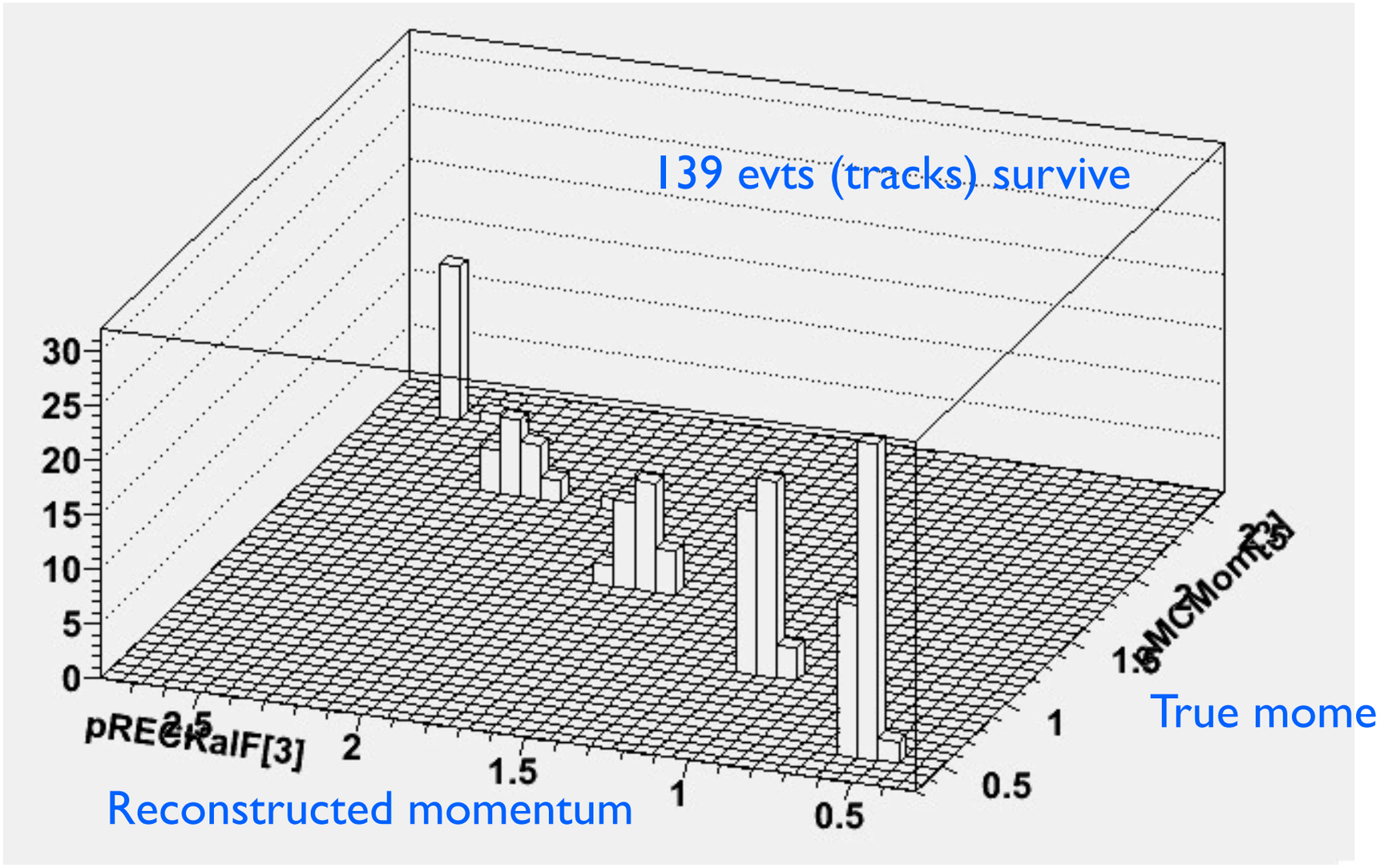
Not every track is fully contained.

Note that 8 extra 3d spacepoint tracks are found here: deltas, I think.

Histogram: the x coordinate of the last spacepoint "ptsNo-1".

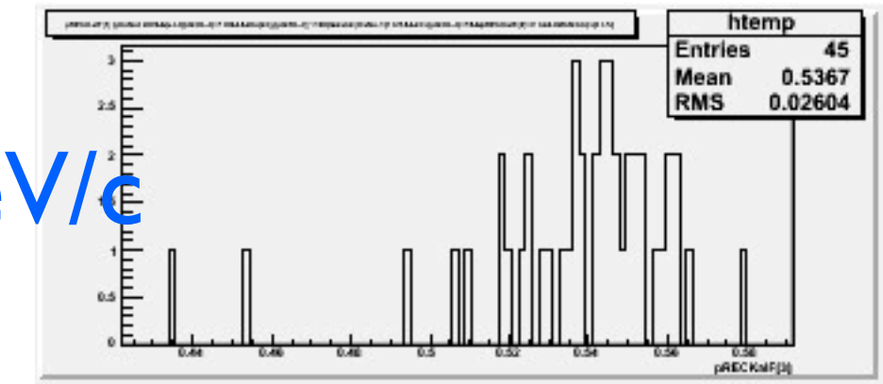


Require FC -- last spacepoint must be in Fiducial Volume and x coordinate under 130 cm.

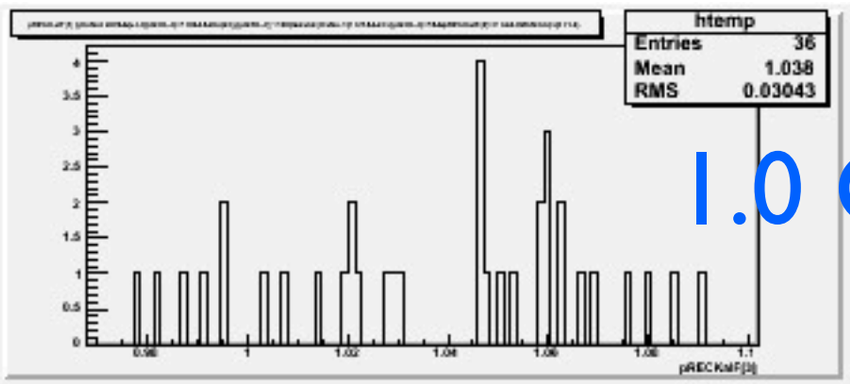


Energy resolutions are better than ~5%.
Needs calibration, still.

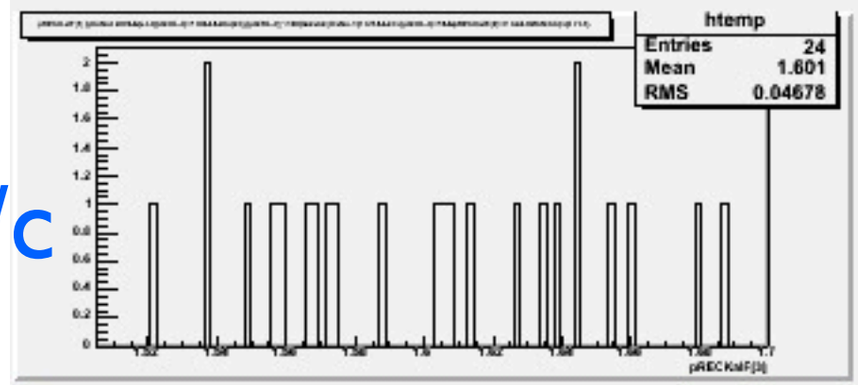
0.5 GeV/c



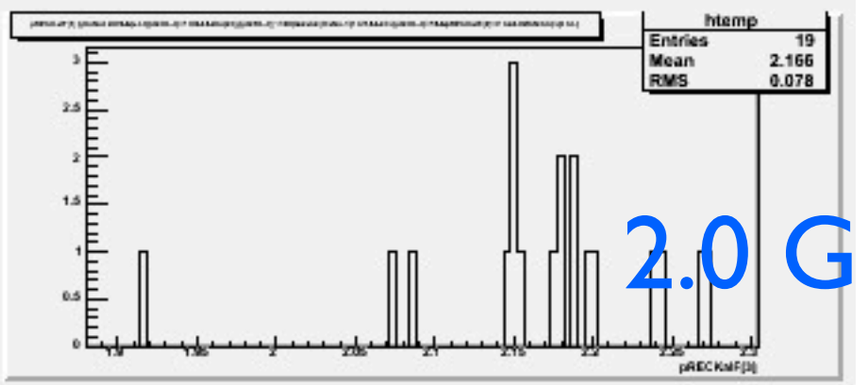
1.0 GeV/c



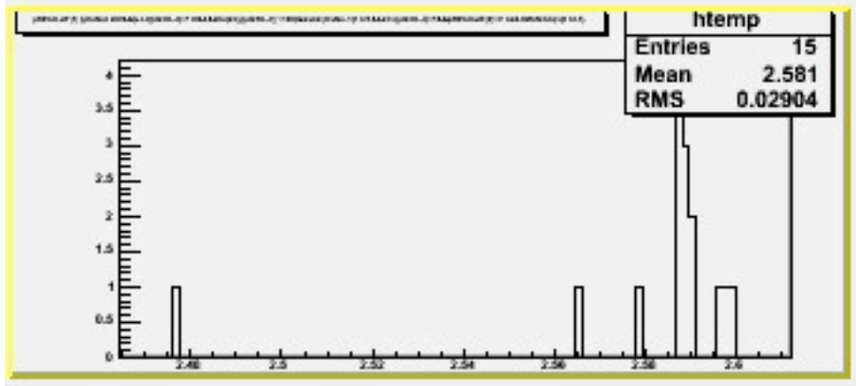
1.5 GeV/c



2.0 GeV/c

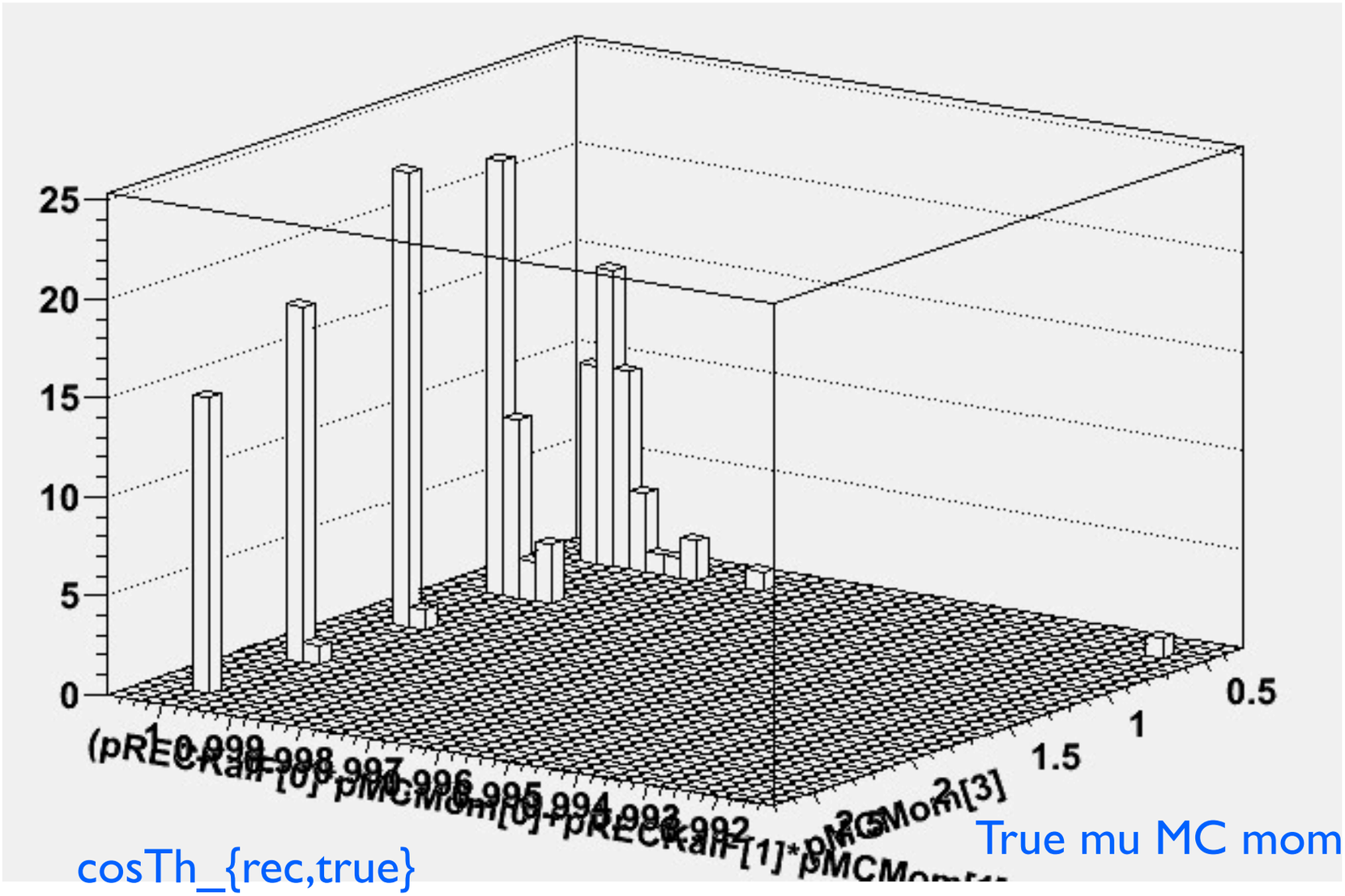


2.5 GeV/c



139 evts

Angular resolutions are 1-2 degrees here.

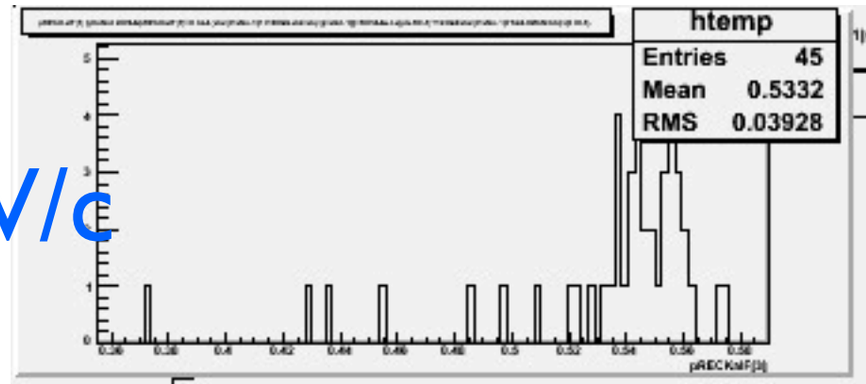


starting values

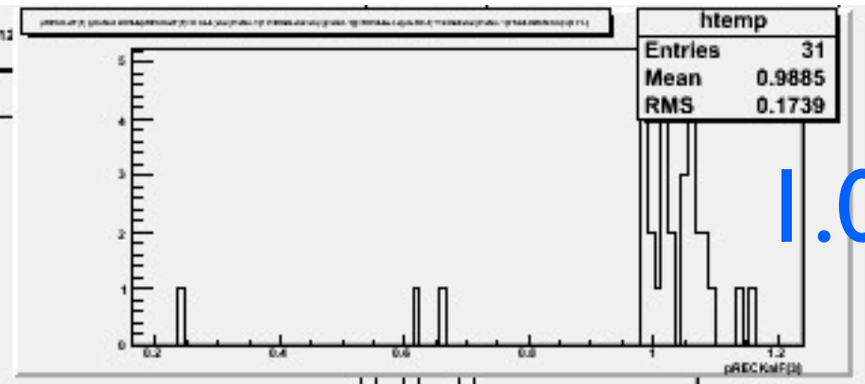
- Some fragility to starting momentum values.
- I set the 3-position of track at x,y,z of first spacepoint. I use 1.20*2.2MeV/cm*(shx[last]-shx[0],shy[last]-shx[0],shz[last]-shz[0]) as starting 3-momentum. And another 20% for low momentum-looking tracks.
- It is imperative not to estimate low. Fitter will gack and fall over. Technical reasons for this.

This just in... Grr (21:00, 24-Oct-2011)

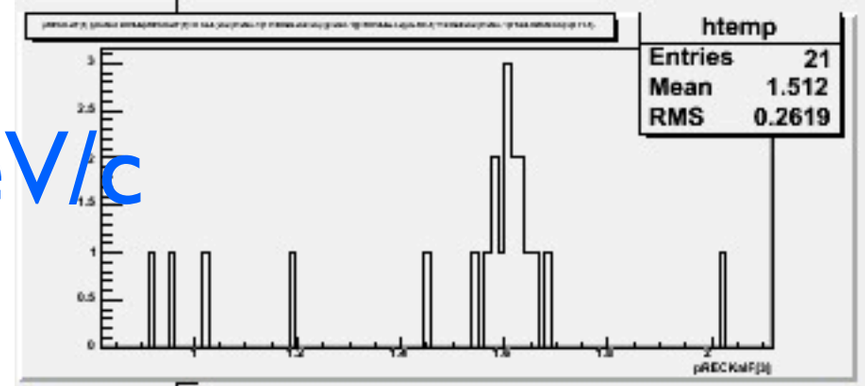
0.5 GeV/c



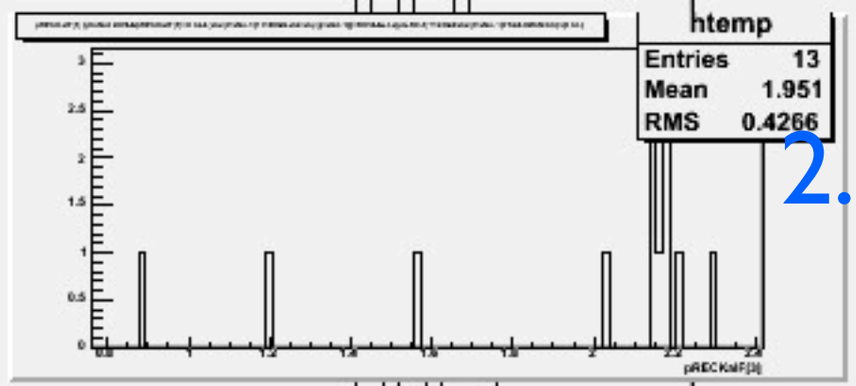
1.0 GeV/c



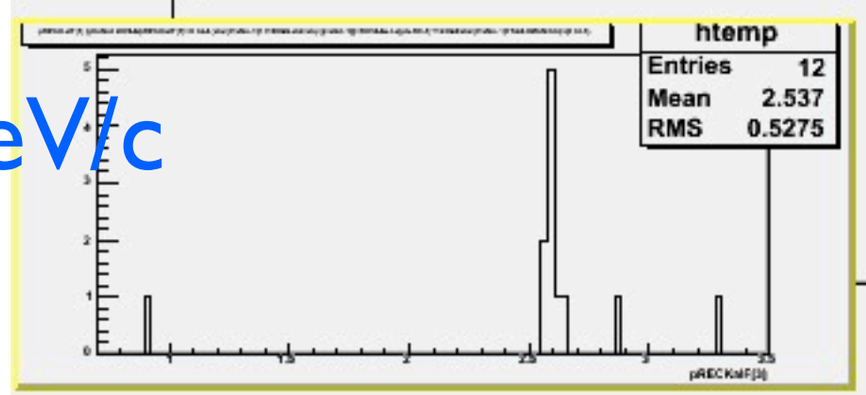
1.5 GeV/c



2.0 GeV/c

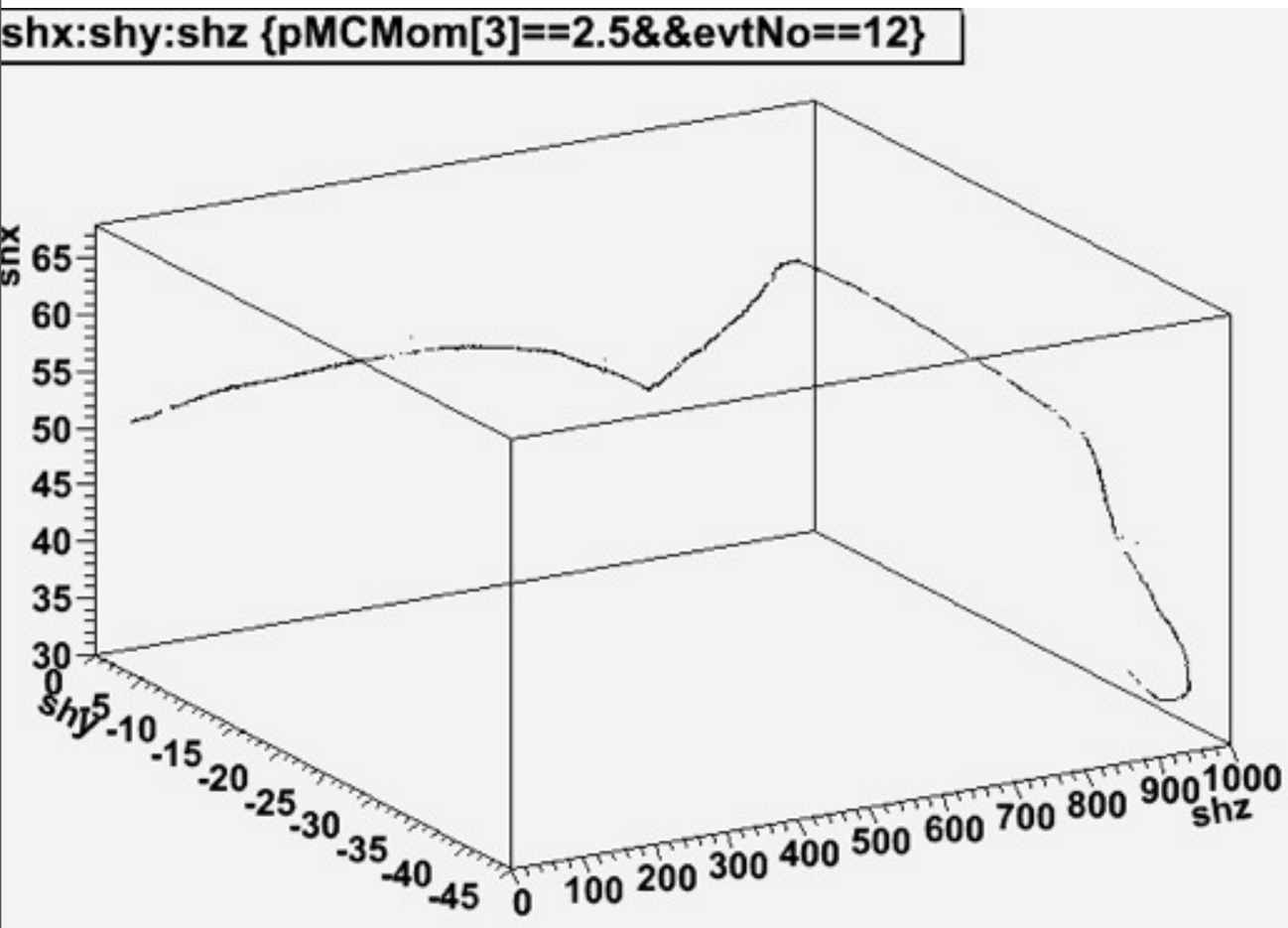


2.5 GeV/c

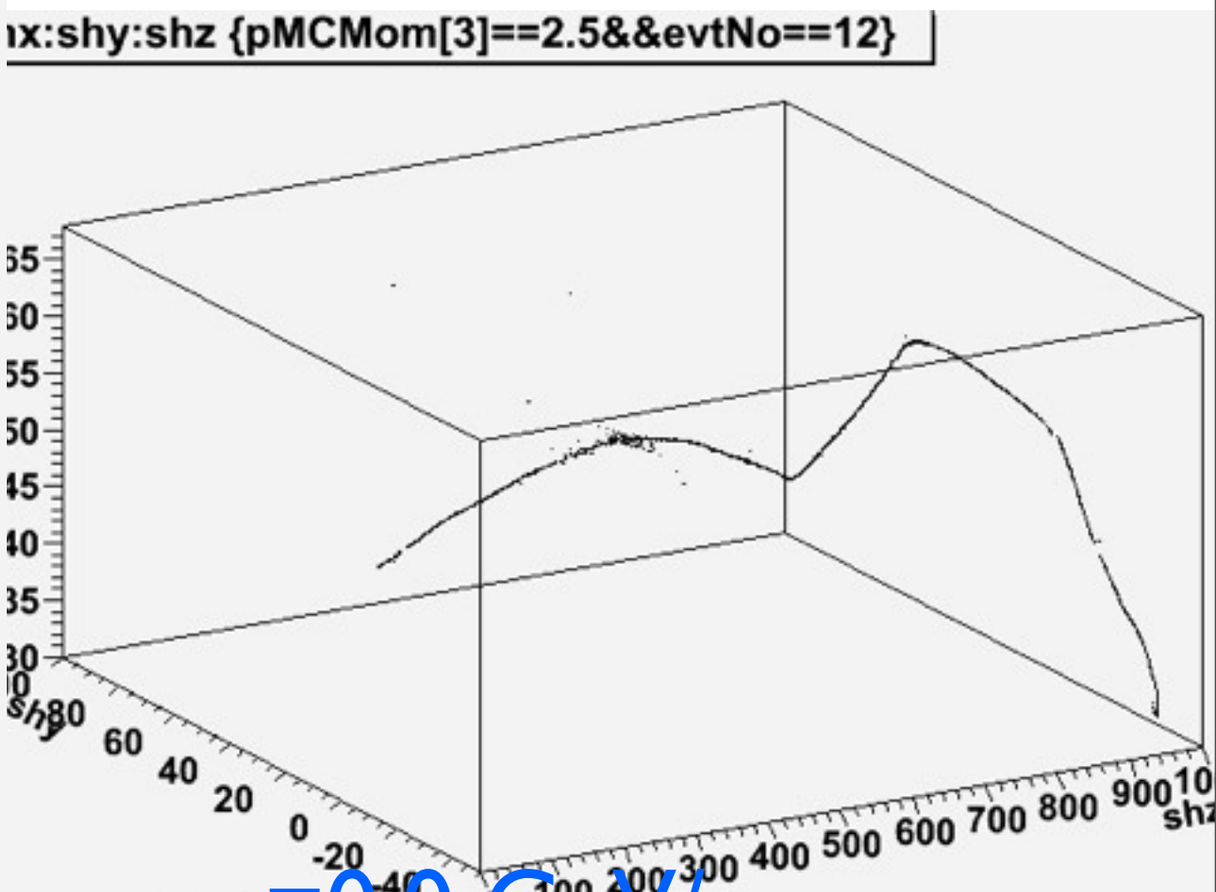


112 evts

SpaceHits with MCTruth T vs F



p_rec=2.47 GeV/c



p_rec=0.0 GeV/c